RedFame

Applied Economics and Finance
Vol. 6, No. 5; September 2019
ISSN 2332-7294 E-ISSN 2332-7308
Published by Redfame Publishing
URL: http://aef.redfame.com

Welfare Effect of Monetary Financing

Tersoo Shimonkabir SHITILE[1] & Abubakar SULE[2]

[1] Central Bank of Nigeria and Economics Department, Nile University of Nigeria (ORCID id 0000-0001-6376-5527).

[2] Department of Economics, Kogi State University, Nigeria (ORCID id 0000-0002-0657-5329).

Correspondence: Tersoo Shimonkabir SHITILE, Central Bank of Nigeria, Abuja, Nigeria.

Disclaimer: *The views expressed in this paper are those of the authors and do not necessarily represent the views of the Central Bank of Nigeria, its Board, or Executive Management.*

Received: July 5, 2019 Accepted: August 2, 2019 Available online: August 13, 2019

doi:10.11114/aef.v6i5.4444 URL: https://doi.org/10.11114/aef.v6i5.4444

Abstract

This study ascertained the direction and asymmetric pass-through of central bank's monetary financing to welfare in Nigeria using annual time series data covering the period 1970 to 2018. The study depended on both the Monetarist and Keynesian theoretical postulations to provide insights on the policy significance of monetary financing. To undertake the empirical analysis, the study applied both the linear Autoregressive Distributed Lag (ARDL) and non-linear ARDL (NARDL) technique. Unlike the ARDL equation, the estimated NARDL equation established that welfare losses respond negatively to both positive and negative changes in monetary financing; but the impact of negative monetary financing shock (7.11) is greater than the positive shock (2.87). In addition, the study found that it takes about 9 to 11 quarters for the changes in positive and negative monetary financing to fully release its effects on welfare loss. Besides, the results revealed that welfare loss is also driven by oil price, which is suggestive from oil price pass-through to domestic prices (exchange rate and consumer prices). The study, therefore, supports monetary financing in proper amounts and conditions to boost aggregate nominal demand but not to spur a fully-fledged monetary policy capture in the process.

Keywords: monetary policy capture, government spending, monetary financing, welfare, autoregressive distributed lag, Nigeria

JEL Classification: E31, E52, E62, I3, C32

1. Introduction

This study considers "monetary policy capture" as implying fiscal dominance, and sees it as whenever narrow interest of the fiscal actions capture the macroeconomic objective of monetary policy. And of the one of the primary goals of monetary policy is maintaining stable prices on a sustained basis, which is an essential condition for improving welfare (economic). According to Central bank of Nigeria (2017) and Ekpo, Asiama and Ahortor (2015), fiscal dominance refers to a regime where monetary policy ensures the solvency of the government, and in the process, loses the control over price stability objective to the concerns of accommodating high levels of public spending. As a result, high and volatile inflation occurs and the monetary authorities are unable to control it because of monetary policy subordination to fiscal dominance (Ekpo et al, 2015). This has attracted a growing line of thought on the influence of government fiscal dominance on monetary variables. Sargent and Wallace (1981) were among the first macroeconomists to provide insight into monetary policy capture in an environment where fiscal policy dominates the coordination game played between monetary and fiscal authorities. Studies by Tanner and Ramos (2002), Blanchard (2004), and Favero and Giavazzi (2004) also attributed high consumer prices to such subordination of monetary policy to fiscal needs. Participating in the discussion, Gallo and Otranto (1998), Frattiani and Spinell, (2001) and Sabatè, Gadea and Escario (2004) alluded that government spending is a critical factor in explaining the channel through which expected growth of the money stock affect prices of consumer goods and services.

Another strand of literature on fiscal dominance relates to the ongoing central bank's monetary financing (see Benes & Kumhof, 2012; Mcculley & Poszar, 2013; Turner, 2013; Wolf, 2013; Dyson & Jackson, 2013; Muellbauer, 2014). In a narrow sense, this has to do with central bank money creation to specifically finance government spending, on a

permanent basis i.e. committing not to sterilize the effects and avoid the Ricardian equivalence problem[1] (Reichlin et al., 2013). Bernanke (2003) supported such policies of monetary financing toward enhancing nominal Gross Domestic Product (GDP) in Japan, when he stated that "…Consider for example a tax cut for households and businesses that is explicitly coupled with incremental Bank of Japan purchases of government debt – so that the tax cut is in effect financed by money creation". Hence, the recognition of monetary financing as a tool used by governments to reduce debt-to-GDP ratios when combined with higher inflation levels-cum-financial repression (Shaw 1973; Mckinnon 1973).

The policy of significant monetary financing has historical antecedents in both Monetarist and Keynesian theoretical traditions. The early Chicago School economists such as, Fisher (1936) and Douglas, Fisher, Graham, Hamilton, King and Whittlesey (1939) argued that money creation should only be conducted by governments/central banks via a "full-reserve banking" policy. Besides, there is also the Keynes influenced equivalents of the "Functional Finance" approach of Lerner (1943) and Wray (1998, 2012)'s "Modern Monetary Theory". The modern monetary theory, in particular, emphasizes that since the ultimate source of monetary control resides with the treasury/central bank in a sovereign fiat-currency regime, it is inconsistent for governments to "borrow" via bond financing; rather there should be no limits on public expenditure to improve the economy using sovereign money creation (Ryan-Collins, 2015). Accordingly, Buiter (2014), Gali (2014) and Fry (1982) were of the view that constrained monetary policy is just a consequence of policy captured which the government purposefully executes in order to obtain 'rents' from the general public at no net liability. Reinhart and Sbrancia (2011) argued that the recent recession fighting response, such as the quasi-fiscal role and purchase of government debt by central banks is simply a practice of monetary policy subordination directed to help moderate the public debt, thereby lowering the real purchasing power of economic units.

In terms of empirical interrogation, the evidence on policy capture remains mixed. Afolabi and Atolagbe (2018), Sanusi and Akinlo (2016), Oladipo and Akinbobola (2011) have established the absence of monetary policy capture in Nigeria; whilst Anfofum, Yahaya and Suleman (2015) and Ozurumba (2012) have reported its presence. From the rest of the world, there are empirical studies that substantiates the unsettled evidence of fiscal dominance: Chaudhary and Ahmad (1995), Jean-Claude (2005), De Resende and Rebei (2008), Makochekanwa, (2011), Keen and Wang (2013), and Koyuncu (2014) found monetary policy capture from fiscal actions, while Kaur (2018) provided contrary results. The dilemma between theoretical and empirical evidence has seen yet another strand of literature towards explaining this puzzle. In an attempt to address the issue, Buffie (1999) argued that the effect of public sector wage cycle underlies the weak correlation between monetary financing (fiscal deficits) and inflationary rate. Catao and Terrones (2005) linked the difficulties in finding a statistically significant and strong relationship between budget deficits and inflation to technical reasons: data samples (especially for advanced economies) and unsatisfactory modeling choice (with regard to developing countries). Unlike advanced nations, Emerging Market and Developing Economies (EMDEs) like Nigeria arguably have less policy space in managing their inter-temporal budget constraints owing largely to the absence of entrenched institutions that checks fiscal excesses, coupled with a central bank not convincingly committed to low inflation and a shallow financial market (Catao & Terrones, 2005; Canzoneri et al. 2001).

But beyond this debate on the existence of fiscal interference in monetary space, there is this theoretical consensus on the inflationary effects of fiscal dominance. The proposition of macroeconomic theory is that, persistent fiscal dominance in form of budget deficits is inflationary (Sargent & Wallace, 1981) but this does not preclude other explanatory factors of inflation. Standard monetarist view is that price stability requires only an appropriate monetary policy. In a somewhat contrast way, Woodford's (1995) fiscal theory of price level argues that the choice of government on how to finance its deficits also strongly determines the time path of the inflation rate. In other words, fiscal actions affect the monetary authority's objective of price stability (Christiano & Fitzgerald, 2000; Kocherlakota & Phelan, 1999). Taking the discussion further, Sims (1999) & Woodford (1998) claimed that allowing the price level to fluctuate with unexpected fiscal (deficit) shocks can potentially generates net public finance benefits. But these expected public finance benefits can be mitigated with associated distortionary costs of price instability (Woodford, 1998; Christiano & Fitzgerald, 2000). Consequently, the literature on EMDEs (Afolabi & Atolagbe, 2018; Kaur, 2018; Harshade 2009) has continued to keep the fiscal view of inflation in the limelight. And the significance of the deficit-inflation relationship debate in developing and high-inflation countries is drawn from fiscal conditions under which they operate: inefficient tax system, limited access to external borrowing and dependence on the inflation tax (Alesina & Drazen, 1991; Cukierman et al., 1992; Calvo & Ve´gh, 1999).

Though the welfare cost of inflation through decrease in household's consumption has been a fundamental issue in macroeconomics (Juin-Jen, Ching-Chong & Chih-Hsing, 2017), standard macroeconomics tend to underestimate the welfare losses by ignoring this arbitrary and unpredictable implicit tax from the deficit-inflation linkage (Hummel,

[1] The public saving its excess money to pay for expected future tax increases that will be used to pay off the increasing debt-financed government spending.

2007). This is understandable because inflation's deadweight loss and its negative effect on net welfare seem to be a popular cost that attracts the attention of most economists (Mankiw, 1997). But that is only a part of the losses that concern the public. It is important to consider the tax transfers resulting from inflation – i.e. inflation's implicit tax on the public cash balances, in which the public unwillingly transfer some of their income into the hands of government. And given that the masses hold a higher proportion of their wealth in the form of cash balances than the rich, the incidence of this implicit tax is regressive. In other words, inflation tax has a welfare cost effect (Cooley & Hansen, 1989). There is, therefore, the need to characterizes price stability as a fundamental social goal and mind the underlying related costs of fiscal dominance (Cochrane, 1998), especially as there is deliberate need to recourse to inflation tax in most EMDEs under a relatively large informal sector, which cannot be directly taxed. This paper thus contributes to literature with quantitative evidence on the existence of a dynamic causal link between central bank monetary financing (of public deficits) and welfare losses (inflation tax).

To achieve this, this study applied a single case study on Nigeria. This choice of Nigeria is based mainly on its price level fluctuation, pro-cyclical fiscal policy with high public deficits, low tax ratios, and monetary financing credentials. The study, therefore, assumes the use of Non-Ricardian fiscal policies in Nigeria where the real value of government debt is expected to grow unsustainably and adjustments to fiscal and monetary policy is made to keep it under control (Christiano & Fitzgerald,2000), and the condition of pro-cyclical policies in an oil exporting economy as modelled by Jalali, Naini and Naderian (2018). Since the stationarity of variables were a combination of I(0) & I(1), the study adapted the ARDL and Non-linear ARDL (NARDL) approach of Shin, Yu and Greenwood-Nimmo (2014) to test whether welfare losses respond asymmetrically to Central Bank of Nigeria (CBN)'s monetary financing changes. The results suggest that there is a positive relationship between asymmetry of monetary financing and welfare losses and that the latter takes about 9 to 11 quarters to fully respond to both a positive and negative monetary financing change.

The remainder of this study is organized as follows. In section 2, the study laid out the empirical literature. Section 3, presents the methodology adopted, the results obtained from the estimation of the model and discussed the welfare effect of monetary policy from fiscal dominance. Section 4, concludes with policy recommendations that follow suit.

2. Empirical Literature

The above discussion highlights conduct in which policy choices (fiscal and monetary) may affect consumer prices, and by extension, welfare. An empirical work is desirable to identify the actual magnitudes of potential welfare effects of monetary financing. A number of studies have attempted to analysis this relationship. The following are some of the studies reviewed based on their methodology and results:

Author	Country	Objective	Method of Study	Findings
Afolabi and Atolagbe (2018)	Nigeria	Analyse fiscal dominance and the conduct of monetary policy	Vector Error Correction Mechanism (VECM) and Cointegration test. Quarterly data series from 1986Q1 – 2016Q4.	No evidence of fiscal dominance in Nigeria. Even as budget deficits have significant impact on money supply.
Sanusi and Akinlo (2016)	Nigeria	Investigate fiscal dominance in Nigeria.	Structural Vector Autoregressive (SVAR) approach. Annual data series from 1986 – 2013.	No causality running from fiscal deficits to growth of monetary base in Nigeria.
Anfofum, Yahaya and Suleman (2015)	Nigeria	Analysis of fiscal deficits – inflation relationship.	Cointegration, Granger causality and Error Correction techniques. Annual data series from 2008 – 2012.	Unidirectional relationship that runs from fiscal deficits to inflation.
Bakare, Adesanya and Bolarinwa (2014)	Nigeria	Examined the link between budget deficit, inflation and money supply.	Cointegration and Error Correction model instruments based on annual data series from 1980 – 2012.	Established long-run inflation to be highly dependent on fiscal deficits in Nigeria.

Ozurumba (2012)	Nigeria	Assessed the causal relationship between fiscal policy and inflation.	Autoregressive Distributed Lag (ARDL). Annual data series from 1970 – 2009.	Corroborates Oladipo and Akinbobola's (2011) findings that there was no causal connection between fiscal deficit and inflation.
Kur (2018)	India	Test the fiscal deficit-inflation relationship	Johansen Cointegration technique with Granger causality test. Annual data series from 1970/71 – 2014/15	No presence of fiscal theory of price in India.
Makochekanwa (2011)	Zim babwe	Studied the deficit - inflation nexus.	Johansen Cointegration approach using annual data series from 1980 – 2005.	Budget deficit significantly influence inflation due to monetization of fiscal spending.
De Resende and Rebei (2008)	Canada, U.S., Mexico, and South Korea	Examined the welfare implications of fiscal dominance.	Bayesian techniques, using quarterly data series: Canada (1957Q1−2005Q1), Mexico (1982Q1−2005Q4), South Korea (1970Q2−2000Q3), and the United States (1957Q1−2006Q1	Absence of fiscal dominance in Canada and the U.S., unlike in Mexico and South Korea. And high fiscal dominance leads to significant welfare losses.
Jean-Claude (2005)	Democratic Republic of the Congo	Analysis of fiscal dominance and inflation relationship.	Multivariate Cointegration and VECM. Annual data series from 1981 – 2003	Positive and significant relationship between budget deficits and seigniorage, and between money creation and inflation in the long-run.
Chaudhary and Ahmad (1995)	Pakistan	Investigated the relationship between money supply, fiscal deficit and inflation.	Ordinary Least Square (OLS) method. Annual data series from 1973 - 1992.	Corroborates Koyuncu (2014) findings that there exists a bi-directional causality between budget deficit and inflation in the long run.

From the empirical literature reviewed, research evidence has been mixed in uncovering this relationship. This present study revisits the welfare issue surrounding the presence of fiscal deficit vis-a-vis monetary policy capture in Nigeria.

3. Methodology

The augmented Nachega (2005)'s data generating process of welfare loss due to macroeconomic variables is as follows:

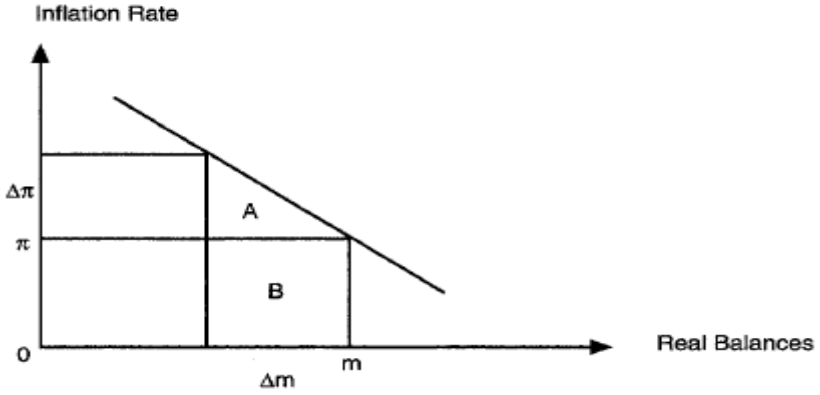
$$W\_LO = f\ (MF, EXCR, CON, OIL\_P) \quad (1)$$

where *W_LO* is the current welfare loss: defined as the reduction in economic well-being or failure to attain determined social utility because marginal social benefits varies from the marginal social cost, *MF* is the central bank monetary finance, *EXCR* is the Bureau de Change (BDC) exchange rate, *CON* is the household aggregate consumption, and *OIL_P* is the Bonny Light oil price which is incorporated into the model as a short-term determinant of welfare effect.

The welfare loss is estimated using real money balances approach by Dowd (1994), where higher inflation transmitting to higher money price (interest rate), drives economic agents to cut real balances and for this reason, welfare loss ensues from an inflation-induced decrease in real balances holdings (Driffil et al. 1990). And because the social cost of producing real balances stay unchanged, variation in welfare loss is then accounted for by real balances effect. According to Dowd (1994), the quantification of the W_LO of an inflation-induced fall in real balances is therefore expressed as:

$$W\_LO\ = \Delta m * \Delta\pi/2 + \pi\Delta m \quad (2)$$

Where π is CPI and m m is monetary aggregate (M1). This implies that if inflation rises from π to $\Delta\pi$, and real money balances fall as a result from m by an amount Δm, the *W_LO* is given by the Area A + B in Figure 1.



Source: Adopted from Dowd (1994)

Figure 1. Inflation and the Demand for Real Balances

This paper, therefore, looks at monetary finance and welfare effect in Nigeria over the period 1970 – 2018 using annual time-series data. The choice of the period for this study is informed by the availability of data sourced from CBN Statistical Bulletin (2018) and World Bank Development Indicators (2018). The descriptive statistics is shown in Appendix.

3.1 Non-Stationarity and Stationarity Tests

The Augmented Dickey-Fuller (ADF) is applied in order to check the integrating properties of the investigated variables. The null hypothesis for ADF is $H_0 : \rho = 0$ while the alternative is $H_1 : \sigma_v^2 > 0$. Z-test is then used for this hypothesis testing in ADF.

3.2 Linear ARDL Model

This study uses Autoregressive Distributed Lag Model (ARDL) in the estimation of the relationship between monetary policy capture and welfare effect. The ARDL model specification of the above functional form is;

$$\Delta W\_LO_t = \varphi_o + \sum_{i=1}^{k} \varphi_{1i}\, \Delta MF_{t-i} + \sum_{i=1}^{k} \varphi_{2i}\, \Delta EXCR_{t-i} + \sum_{i=1}^{k} \varphi_{3i}\, \Delta CON_{t-i} + \sum_{i=1}^{k} \varphi_{4i}\, \Delta OIL\_P_{t-i} + \delta_1 MF_{t-i}$$

$$+ \delta_2 EXCR_{t-i} + \delta_3 CONS_{t-i} + \delta_4 OIL\_P_{t-i} + +\varepsilon_t \quad (3)$$

Where Δ is difference operator, k is the lag length and μ_t is assumed to be serially uncorrelated. The cointegration test is based on the F-statistics. The error correction representation is specified as follows:

$$\Delta W_{LO_t} = \sigma_o + \sum_{i=1}^{k} \sigma_{1i}\, \Delta MF_{t-i} + \sum_{i=1}^{k} \sigma_{2i}\, \Delta EXCR_{t-i} + \sum_{i=1}^{k} \sigma_{3i}\, \Delta CON_{t-i} + \sum_{i=1}^{k} \sigma_{4i}\, \Delta OIL_{P_{t-i}} + \lambda ECM$$

$$+ \varepsilon \quad (4)$$

Where λ is the speed of adjustment parameter and error correction term (*ECM)* is the residuals obtained from equation 4. The coefficient of the lagged error correction term (λ) is expected to be negative and statistically significant to further confirm the existence of a cointegrating relationship. And ε_t is an error term, which is a $i.i.d\ (0, \Sigma)$ process.

3.3 NARDL Bounds Model

Following ARDL model, the NARDL approach is as follows:

$$lnW\_LO_t = a_0 + \delta_1 lnMF_t + \delta_2 lnEXCR_t + \delta_3 lnCON_t + \delta_3 lnOIL\_P_t + \varepsilon_t \quad (5)$$

Where ln denotes the natural logarithms of the variables, and the variables as defined earlier. Based on the studies by Park and Phillips (2001), Bae and de Jong (2007), Apergis (2015) and the recent study by Usman, and Elsalih (2018), we specify the nonlinear ARDL by disintegrating the independent variables into their positive and negative sums as follows:

$$z_t^+ = \sum_{j=1}^{t} \Delta z_j^+ = \sum_{j=1}^{t} \max(\Delta z_j, 0) \quad \text{and} \quad z_t^- = \sum_{j=1}^{t} \Delta z_j^- = \sum_{j=1}^{t} \min(\Delta z_j, 0) \quad (6)$$

where z_t represents lnY_t. Δz_t^+ and Δz_t^- are perhaps the sum of the positive and negative shocks in government fiscal dominance level. The presence of the short-run symmetry ($\beta^+ = \beta^-$) and long-run symmetry ($\gamma^+ = \gamma^-$) for all the variables is ascertained by using bounds test and statistical significance. The lag order of the dependent and independent variables is represented by p and q respectively. To examine the long-run asymmetric cointegration among the variables, Shin *et al.* (2014) proposed two operational tests, which include the bounds testing procedure of Pesaran, et al. (2001) through a modified F-statistic (F_{PSS})with $H_0: \gamma = \gamma^+ = \gamma^- = 0$. The second test is the t-statistic (t_{BDM}) proposed by Banerjee *et al.* (1998). The cointegration test is conducted using the level variables. If the computed statistic is greater than the upper bound critical value, the H_0 is rejected, which indicates the existence of a long-run relationship among variables.

The framework for Nonlinear ARDL error correction form as advanced by Shin *et al*. (2014) based on our study is provided in equation 7:

$$\Delta lnW\_LO_t = \alpha_0 + \vartheta lnW\_LO_{t-1} + \gamma_1^+ lnMF_{t-1}^+ + \gamma_2^- lnMF_{t-1}^+ + \sum_{i=1}^{p} \alpha_1\, \Delta lnW\_LO_{t-i} + \sum_{i=0}^{q} \alpha_2\, \Delta lnMF_{t-i}^+ + \sum_{i=0}^{q} \alpha_3\, \Delta lnMF_{t-i}^- + \sum_{i=0}^{q} \alpha_4\, \Delta lnEXCR_t + \sum_{i=0}^{q} \alpha_5\, \Delta lnCON_t + \sum_{i=0}^{q} \alpha_5\, \Delta lnOIL\_P_t + \mu_t \quad (7)$$

Where α_i represents the short-run coefficients and $\gamma_i$represents the long-run coefficients respectively. The first part of equation (6) estimates the long-run coefficients while the second part estimates the short-run coefficients. Specifically, the positive and negative long-run asymmetric coefficients are computed based on $L_m^+ = -\gamma^+/\vartheta$ and $L_m^- = -\gamma^-/\vartheta$, while the positive and negative short-run coefficients are given as $\sum_{i=0}^{q} \alpha_2\, \Delta lnY_{t-i}^+$ and $\sum_{i=0}^{q} \alpha_3\, \Delta lnY_{t-i}^-$.

3.4 Presentation of Results and Analysis

Table 1. Dickey and Fuller (1979, 1981) Test

Variables	*At Level*	*First Difference*	*Order of Cointegration*
Ln W_LO			
Intercept	3.063206	-13.28812***	I(1)
Intercept & Trend	-1.605072	-1.605072	
Ln MF			
Intercept	4.701261	-3.104049**	I(1)
Intercept & Trend	-0.822670	-0.822670	
Ln EXCR			
Intercept	0.346486	-7.236390***	I(1)
Intercept & Trend	-1.792931	-7.514926	
Ln OIL_P			
Intercept	3.063206	-6.964256***	I(1)
Intercept & Trend	-1.605072	-6.888488	
LnCON			
Intercept	0.012402	-8.637446***	I(1)
Intercept & Trend	-1.317489	-8.875010	

*Notes: ***, ** and * denote 1%, 5% and 10% significance levels at which the null hypothesis of non-stationarity is rejected for all tests. The intercept and trend and intercept are included in the levels and the first difference equations. The optimal lag order are selected based on Schwarz information Criterion (SIC).*

Source: Extract from results

Table 1 shows that the series are not stationary at level I(0) but stationary after first difference i.e. I(1) based on ADF test. This necessitates the application of the Bounds test for variables cointegration in the ARDL /NARDL model.

Table 2. Bounds Test for Linear ARDL and Non-Linear ARDL (NARDL)

Linear ARDL			**NARDL**		
Model:			Model:		
F(W_LO/MF, EXCR, CON, OIL_P)			F(W_LO/MF(NEG), MF(POS), EXCR,CONS, OIL_P)		
Critical value	Lower Bound	Upper Bound	Critical value	Lower Bound	Upper Bound
1%	3.29	4.37	1%	3.06	4.15
5%	2.56	3.49	5%	2.39	3.38
10%	2.2	3.09	10%	2.08	3.00
F-Statistics	8.944177		F-Statistics	8.405387	
Critical values from Narayan (2005)					

Source: Extract from results

Table 2 shows that the f-statistic at 8.94 and 8.41 for the Linear ARDL and Non-Linear ARDL, respectively, is greater than the critical values at 1%. This implies that there exists cointegration among the variables under consideration. Given the presence of cointegration amongst the variables, long-run dynamics can be evaluated.

Table 3. Estimated Long-run Coefficients of Welfare Effect of Asymmetric Monetary Financing

Linear ARDL Model			**NARDL Model**		
Variable	Coefficient	p-value	Variable	Coefficient	p-value
MF	1.3025	0.0584	MF(POS)	-2.8721	0.0017
			MF(NEG)	-7.1070	0.0290
EXCR	-1.5825	0.8495	EXCR	13.4295	0.0525
CON	0.0333	0.0002	CON	0.0068	0.0598
OIL_P	61.8560	0.0775	OIL_P	-26.9622	0.2014
C	-5669.0530	0.0000	C	-526.2728	0.3396
ECM(-1)	-1.521319	0.0066	ECM(-1)	-6.887545	0.0001

Source: Extract from results

The results of the long-term equations in Table 3 are mixed. The estimated linear ARDL model shows that monetary financing accelerates welfare loss through high inflation. Welfare loss is also driven by oil price, which might be from pass-through to domestic prices (exchange rate and consumer prices). Foreign exchange rate, however, has moderating effect on welfare loss but not is not significant.

For the estimated NARDL model, both positive and negative monetary finance shocks reduce welfare loss but the impact of negative monetary financing shock (7.11) is greater than the positive shock (2.87), indicating monetary finance stimulation of aggregate nominal demand. This entails that monetary financing in Nigeria matter, and is used in appropriate quantities and circumstance of low-employment economy as suggested by Turner (2015). From the result, a change in foreign exchange rate would increase welfare loss. This conforms to reported channels: spillover effects on imbalances, inflation, and output gap (Engel, 2014); expectation, habit persistence, and asymmetric asset markets (Bergin & Tchakarov, 2003); and existence of multi-exchange rate system (Donald, 1975). Oil price lowers welfare loss in estimated NARDL model but its effect is not significant.

Consumption is not quantitatively significant in both the linear and non-linear ARDL model; this outcome points toward the presence of negative externalities and myopic behaviour (Abrardi & Cambini, 2018). Importantly, the variations in the results of the Linear ARDL and NARDL models brings to light the need for choosing appropriate methodological approach to profitably ensure reliability of results and optimal policy implication. Besides, the speed of adjustment to equilibrium for both linear and non-linear ARDL is negatively signed as required – estimated at 1.52% and 6.88%, respectively and statistically significant at 1 per cent.

Table 4. Diagnostic Test

Linear ARDL			NARDL	
LM Test	*F-statistic*	*Prob.*	*F-statistic*	*Prob.*
Coefficients	0.750959	0.4827	1.893680	0.2442
Heteroskedasticity Test ARCH				
Coefficients	0.258642	0.6138	0.249448	0.6202

Source: Extract from results

The diagnostic tests of serial correlation Lagrange Multiplier (LM) and autoregressive conditional heteroskedasticity (ARCH) presented in Table 4 failed to established serial correlation and was unsuccessful to reject homoscedasticity in the data using the Breusch-Pagan (1980[2]) LM test and ARCH test at lag 1. To ascertain the stability of the coefficients of all variables in the models, the cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) were carried

[2]Breusch, T.S., and Pagan, A.R. (1980), "The Lagrange Multiplier Test and its Application to Model Specifications in Econometrics", Review of Economic Studies, 47, 239-53

out using Brown et al (1975[3]) model stability tests and the graphs are presented in Figure 2a, 2b, 3a and 3b. The movement of the recursive residuals oscillated within and outside the critical bounds. Overall, plots of the CUSUM suggest that the regression equation were stable considering that the CUSUM test statistic does not go beyond the bounds of the 5% and 2% level of significance for Linear ARDL and NARDL, respectively. And those behaviors of the coefficients of CUSUMSQ have the capacity to equilibrate in the long-run horizon. Further, taking a cue from Shin et al (2014[4]), the study extracted long-run cumulative dynamic multipliers following asymmetric change to the monetary financing and how the changes impact welfare loss. Figure 4 shows that welfare losses take about 9 to 11 quarters to react to a unit change (increase and decrease) in the monetary financing.

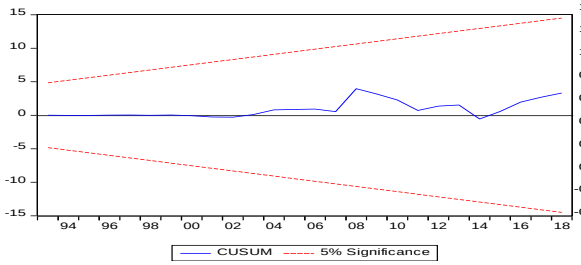


Figure 2a. CUSUM for Linear ARDL

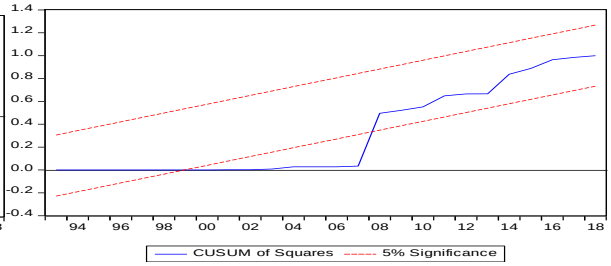


Figure 2b. CUSUM Square for Linear ARDL

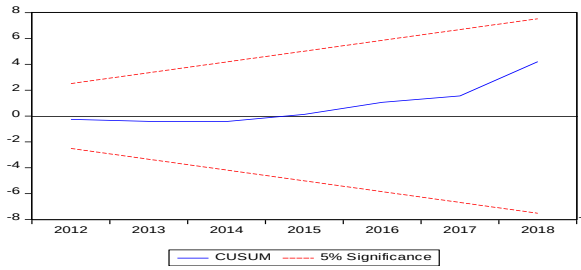


Figure 3a. CUSUM for NARDL

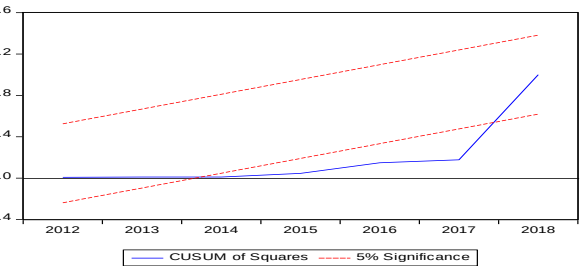


Figure 3b. CUSUM Square for NARDL

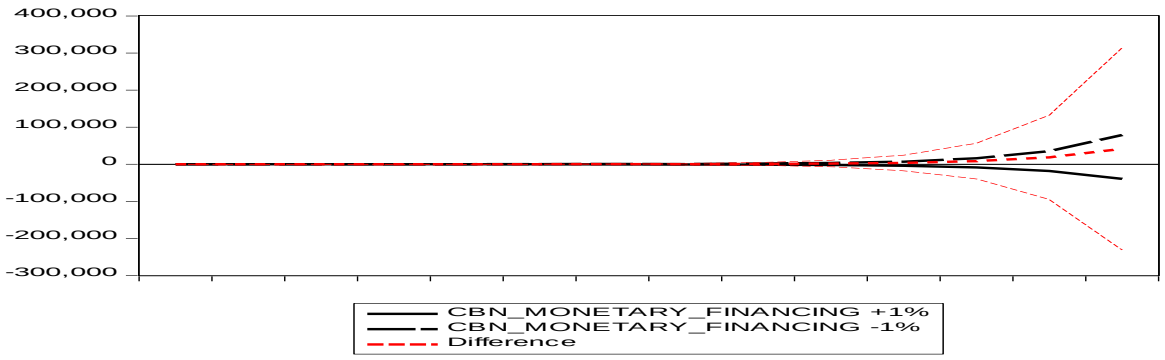


Figure 4. Dynamic Multiplier Graph

4. Conclusion

This study on monetary policy capture and welfare is motivated by theoretical consensus that monetary financing causes inflation, and the potential benefits of leading empirical literature to welfare cost of implicit tax inflation. The

[3]Brown, R.L., J. Durbin, and Evans, J.M. (1975), "Techniques for Testing the Constancy of Regression Relations Over Time," Journal of the Royal Statistical Society, Series B, 37, 149-163.

[4]Shin, Y., Yu, B. and Greenwood-Nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in an ARDL Framework. In: Horrace, W.C., Sickles, R.C. (eds), Festschrift in Honor of Peter Schmidt. Springer Science and Business Media, New York.

choice of a single case of Nigeria is based on its high public deficits, low tax ratios, monetary finance credentials, and high consumer prices. In order to ascertain the direction of this dynamics, the study evaluated the validity of the pass-through of monetary financing to welfare loss in Nigeria from 1970 to 2018, using both the linear and Non-linear ARDL techniques.

The findings of the estimated long-run linear ARDL model reveal that welfare loss responds positively to monetary financing and is statistically significant at 10%, thus, suggesting that, welfare loss is sensitive to changes in monetary financing. For the estimated non-linear ARDL model, both positive and negative changes in monetary financing was found to have asymmetric (magnitude) and negative impact on welfare loss whilst the impact of negative monetary financing shock (7.11) is greater than the positive shock (2.87). The relationship is statistically significant at 5% and 10%, for positive and negative shocks, respectively. The difference in the results of Linear ARDL and NARDL model emphasizes the need for an adequate method to correctly produce reliable or repeatable empirical results. The results of the NARDL model established that monetary finance matters in reducing welfare loss in Nigeria, which supports Gali's (2014) assertion that "if the steady state is sufficiently inefficient, an increase in government purchases financed by money creation may increase welfare even if such spending is wasteful". The study also found that it takes about 9 to 11 quarters for the positive and negative monetary financing changes to fully unleash its effects on welfare losses. Besides, the results reveal that welfare loss is also driven by oil price, which is suggestive from oil price pass-through to domestic prices (exchange rate and consumer prices).

Given that Nigeria's economy is still operating below full employment, this study agrees with Turner (2015) that monetary financing is required, and supported in appropriate quantities and circumstances to drive aggregate nominal demand and welfare. However, monetary financing (of government spending or deficits) should be guided by proven rules and responsibilities restraining the central bank to avoid monetary policy capture and its potentially adverse side-effects.

References

Abrardi, L., & Cambini, C. (2018). Incentives to Correct Misbehaviour: When Less is Better. Available at https://icare.hse.ru/data/2018/10/22/1142317550/Abrardi_Laura_ Camboni.pdf

Afolabi, J. O., & Atolagbe, O. (2018). Empirical analysis of fiscal dominance and the conduct of monetary policy in Nigeria. *Munich Personal RePEc Archive* (MPRA) Paper No. 88786, 6 September 2018.

Anfofum, A. A., Yahaya, A. O., & Suleman, T. (2015). Empirical investigation of fiscal deficits and inflation in Nigeria. *European Journal of Business and Management* www.iiste.org ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online), *7*(9), 2015.

Bakare, A. O., Adesanya, O. A., & Bolarinwa, S. A. (2014). Empirical investigation between budget deficits, inflation and money supply in Nigeria. *European Journal of Business and Social Sciences*, *2*, 120-134.

Barro, R. J. (1987). Government spending, interest rates, prices, and budget deficits in the United Kingdom1701–1918. *Journal of Monetary Economics*, *20*, 221–247. http://dx.doi.org/10.1016/0304-3932(87)90015-8

Benes, J., & Kumhof, M. (2012), 'The Chicago Plan Revisited', IMF Working Papers, *12*(102).

Bergin, P. R., & Tchakarov, I. (2003). "Does Exchange Rate Risk Matter for Welfare?" NBER Working Papers 9900, National Bureau of Economic Research, Inc.

Binder, C. C. (2018). Inequality and the Inflation Tax, Haverford College, Department of Economics, mimeo.

Bohn, H. (1998). The behaviour of U.S public debt and deficits. *Quarterly Journal of Economics*, *113*, 949-964. http://dx.doi.org/10.1162/003355398555793

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange Multiplier Test and its Application to Model Specifications in Econometrics, *Review of Economic Studies, 47,* 239-53.

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. Journal of the Royal Statistical Society: Series B (Methodological), *37*(2), 149-163.

Brown, R. L., Durbin, J. & Evans, J. M. (1975). Techniques for Testing the Constancy of Regression Relations Over Time, Journal of the Royal Statistical Society, Series B, *37*, 149-163.

Canzoneri, M. B., Cumby, R., Diba, B. T. (2001). Is the price level determined by the needs of fiscal solvency? *American Economic Review, 91*, 1221-1238.

Canzoneri, M. B., Cumby, R. E., & Diba, B. T. (2001). Is the price level determined by the needs of fiscalsolvency? *American Economic Review*, *91*(5), 1221-38. http://dx.doi.org/10.1257/aer.91.5.1221

Catao, L.a.V., & Terrones, M. E. (2005). 'Fiscal deficits and inflation', Journal of Monetary Economics, *52*(3), 529-554.

Central Bank of Nigeria. (2017). Fiscal policy at a glance. Monetary Policy Department, Central Bank of Nigeria.

Central Bank of Nigeria. (2018). Annual Statistical Bulletin, Abuja-Nigeria.

Ceyda, O. (2010). What is Inflation: Back to Basics. Finance & Development, IMF's Asia and Pacific Department, March, 2010.

Christiano, L. J., & Fitzgerald. T. J. (2000). Understanding the Fiscal Theory of the Price Level. Economic Review, Quarter 2, *36*(2).

Cooley, & Hansen (1989). The inflation tax in a real Business Cycle Model. *The American Economic Review*, *79*(4), 733-74.

De Resende, C., & Rebei, N. (2008). The welfare implications of fiscal dominance. *Bank of Canada Working Paper* 2008-28, September 2008.

Douglas, P. H., Fisher, I., Graham, F. D., Hamilton, E. J., King, W. I., & Whittlesey, C. R. (1939). 'A Program for Monetary Reform', Colorado State College Working Paper.

Dyson, B., & Jackson, A. (2013). Modernising Money, London: Positive Money.

Ekpo, A., Asiama, J. P., & Ahortor, C. R. K. (2015). Fiscal dominance and central bank independence. A paper presented at the 2015 AACB symposium of the Governor, Malabo, Equatorial Guinea,13th August 2015.

Engel, C. (2014). Exchange Rate Stabilization and Welfare. *Annual Review of Economics*, *6*, 155-177. (Volume publication date August 2014). https://doi.org/10.1146/annurev-economics-080213-041417

Favero, C., & Spinelli, F. (1999). Testing Hypotheses on the Monetary History of Italy: 1875 1995. *Economic Notes, 28*, 43-71. https:// doi.org/10.1111/1468-0300.00004

Fisher, I. (1936), '100% money and the public debt', Economic Forum, No. April-June, 406-420.

Fratianni, M., & Spinelli, F. (2001). Fiscal dominance and money growth in Italy: the long record. *Explorationsin Economic History*, *38*, 252–272. https:// doi.org/10.1006/exeh.2000.0753

Friedman, M. (1968). The Role of Monetary Policy, *American Economic Review*, *58*, 1-17.

Gal Ì J. (2014). The Effects of a Money-Financed Fiscal Stimulus. Universitat Pompeu Fabra and Barcelona, Centre de Recerca en Economia Internacional. Available at http://crei.cat/people/gali/gmoney.pd

Gallo, G. M., & Otranto, E. (1998). Inflation in Italia (1863–1994): Nonlinearita è cambiamentidi regime. Universitadi Firenze, Dipartimento di Statistical.

Gokal, V., & Hanif, S. (2004). Relationship between inflation and economic growth. Reserve Bank of Fiji. Available on www.rbf.gov.fj. Accessed on 5/5/2019

Huddle, D. L. (1975). Measurements of Static Welfare Losses, Distribution Inequities, and Revenues in the Brazilian Multiple Auction Exchange Rate System. *The Quarterly Journal of Economics*, *89*(3), August 1975, 490-503. https://doi.org/10.2307/1885270

Hummel, J. R. (2007). Death and Taxes, Including Inflation: The Public versus Economists. *Econ Journal Watch*, *4*(1), (January 2007), 46-59.

IMF (2019). Regional economic outlook for sub-Saharan Africa. Available at https://allafrica.com/stories/201905010110. Accessed on 4/5/2019

JalaliNaini, A. R., & Naderian, M. A. (2018). Oil price cycles, fiscal dominance and countercyclical monetary policy in Iran. *OPEC Energy Review, 43*(1), 3-28(March 2019). https://doi.org/10.1111/opec.12125

Juin-Jen, C., Ching-Chong, L., & Chih-Hsing, L. (2017). Welfare cost of inflation: the role of price markups and increasing returns to production specialization. *Munich Personal RePEc Archive (MPRA)*, Paper No. 77753, March 2017.

Kaur, G. (2018). The relationship between fiscal deficit and inflation in India: a cointegration analysis. *Journal of Business Thought*, *8*, April 2017-March 2018.

Kocherlakota, N., & Phelan, C. (1999). Explaining the fiscal theory of the price level. Federal Reserve Bank of Minneapolis. *Quarterly Review-Federal Reserve Bank of Minneapolis, 23*(4), 14.

Leep, E. M. (1991). Equilibria under 'active' and 'passive' monetary and fiscal policies. *Journal of Monetary Economics*, *27*(1), 129-147. https:// doi.org/10.1016/0304-3932(91)90007-B

Lerner, A. P. (1943). 'Functional finance and the federal debt'. *Social research*, *10*(1), 38-51.

Liviatan, N. (2003). Fiscal dominance and monetary dominance in the Israeli monetary experience. Bank of Israel Research Department, *Discussion Paper* No. 2003.17, November 2003

Makochekanwa, A. (2011). Impact of budget deficit on inflation in Zimbabwe. Journal *of Economic Research, 1,* 49-59.

Mankiw, N. G. (1997). Comment. In Reducing Inflation: Motivation and Strategy, ed. Christina D. Romer and David H. Romer. Chicago: University of Chicago Press.

Mcculley, P., & Poszar, Z. (2013). 'Helicopter Money: or how I stopped worrying and love fiscal-monetary cooperation', Global Society of Fellows, 7.

Mckinnon, R. I. (1973). Money and capital in economic development, Washington D.C.: Brookings Institution Press.

Melitz, J. (1997). Some cross-country evidence about debt, deficits and the behavior of monetary and fiscal authorities. *CEPR Discussion Papers*1653.

Mishkin, F. S. (2000). Inflation targeting in emerging-market countries, *The American Economic Review*, Papers and Proceedings, *90*(2), 105-109.

Montoro, C., Takáts, E., & Yetman, J. (2012). Is monetary policy constrained by fiscal policy? *BIS Papers, 67*, October, 11-30. Available on https://www.bis.org/publ/bppdf/bispap67b_rh.pdf. Accessed on 27/4/2019

Muellbauer, J. (2014). 'Combatting Eurozone deflation: QE for the people', VoxEU.org: CEPR.

Nachega, J. (2005). Fiscal dominance and inflation in the Democratic Republic of the Congo. *International Monetary Fund* WP/05/221

Narayan, P. K. (2005). The saving and investment nexus for China: evidence from cointegration tests. *Applied economics, 37*(17), 1979-1990.

Oladipo, S. O., & Akinbobola, T. O. (2011). Budget deficit and inflation in Nigeria: A causal relationship. *Journal of Emerging Trends in Economics and Management Sciences, 2*(1), 1-8.

Omotosho, B. S., Bawa, S., & Doguwa, S. I. (2016). Determining the optimal public debt threshold for Nigeria. *CBN Journal of Applied Statistics, 7*(2), (December, 2016).

Ozurumba, B. A. (2012). Fiscal deficit and inflation in Nigeria: The causal approach. *International Journal of Science and Technology Research, 5,* 6-12.

Reichlin, L., Turner, A., & Woodford, M. (2013), 'Helicopter money as a policy option', VoxEU.org, August 21. Available at: http://blogs.reuters.com/felix-salmon/2012/09/03/why-you-wont-find-hyperinflation-in-democracies/

Sabatè, M., Gadea, M. D. and Escario, R. (2004). Does fiscal policy influence monetary policy? The case of Spain, 1874-1935. *Explorations in Economic History, 43*, 309-331. http://dx.doi.org/10.1016/j.eeh.2005.03.003

Sanusi, K. A., & Akinlo, A. E. (2016). Investigating fiscal dominance in Nigeria. *Journal of Sustainable Development, 9*(1), 2016.

Sargent, T. J., & Wallace, N. (1981). Some unpleasant monetarist arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review*, (Fall), 1-17.

Shaw, E. S. (1973). Financial deepening in economic development, New York: Oxford University Press.

Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in an ARDL Framework. In: Horrace, W. C., Sickles, R. C. (eds), Festschrift in Honor of Peter Schmidt. Springer Science and Business Media, New York.

Sims, C. A. (1994). A simple model for study of the determination of the price level and the interaction of monetary and fiscal policy. *Economic Theory, 4*(3), 381-399.

The public saving its excess money to pay for expected future tax increases that will be used to pay off the increasing debt-financed government spending.

Totonchi, J. (2011). Macroeconomic Theories of Inflation, International Proceedings of *Economic Development and Research*(4).

Turner, A. (2013). 'Debt, Money, and Mephistopheles: How Do We Get Out of this Mess?', Cass Business School Annual Lecture, London, 6th February 2013.

Turner, A. (2015). The Case for Monetary Finance–An Essentially Political Issue. IMF Jacques Polak Research Conference 5th November 2015.

Wolf, M. (2013). 'The case for helicopter money', The Financial Times, February 12.

Woodford, M. (1995). Price level determinacy without control of a monetary aggregate. *Carnegie-Rochester Conference Series on Public Policy, 43,* 1-6. https://doi.org/10.1016/0167-2231(95)90033-0 SSRN 225268

Woodford, M. (1998). Public Debt and the Price Level, Paper presented at the Conference on Government Debt Structure and Monetary Conditions, Bank of England, June 18–19, 1998. Available http://www.princeton.edu/~woodford/BOE.pdf

Wray, L. R. (1998). Understanding modern money, Cheltenham: Edward Elger

Wray, L. R. (2012). Modern money theory: A primer on macroeconomics for sovereign monetary systems, Hampshire: Palgrave Macmillan.

Appendix:

Descriptive Statistics

	EXCR (₦/USD)	MF (BILLION)	CON (BILLION)	OIL_P (USD/PB)	WELFARE_LOSS
Mean	89.66131	1723.521	219412.0	36.09563	3841.446
Median	80.14500	325.6570	152033.0	26.60000	184.1645
Maximum	455.2600	13697.00	474932.4	114.4900	62230.52
Minimum	0.796528	0.215000	84094.35	2.650000	-2337.237
Std. Dev.	106.1765	3404.249	129667.3	29.68310	10389.56
Skewness	1.513411	2.243625	0.926549	1.326941	4.346043
Kurtosis	5.359664	6.947362	2.217207	3.860999	23.23055
Jarque-Bera	29.45934	71.43415	8.093480	15.56883	969.6553
Probability	0.000000	0.000000	0.017479	0.000416	0.000000
Sum	4303.743	82729.02	10531774	1732.590	184389.4
Sum Sq. Dev.	529852.5	5.45E+08	7.90E+11	41411.05	5.07E+09
Observations	48	48	48	48	48